

2011 MCAS Exam Test Items

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Test item alignment to
Energy 1: Integrating Sciences through Energy
Questions 1, 6, 10 & 21 directly align.

XVII. Science and Technology/Engineering, Grade 8

Grade 8 Science and Technology/Engineering Test

The spring 2011 grade 8 MCAS Science and Technology/Engineering test was based on learning standards in the Massachusetts *Science and Technology/Engineering Curriculum Framework* (2006). The *Framework* identifies four major content strands listed below. Page numbers for the grades 6–8 learning standards appear in parentheses.

- Earth and Space Science (*Framework*, pages 32–33)
- Life Science (Biology) (*Framework*, pages 51–53)
- Physical Sciences (Chemistry and Physics) (*Framework*, pages 67–68)
- Technology/Engineering (*Framework*, pages 87–89)

The *Science and Technology/Engineering Curriculum Framework* is available on the Department website at www.doe.mass.edu/frameworks/current.html.

In test item analysis reports and on the Subject Area Subscore pages of the MCAS *School Reports* and *District Reports*, Science and Technology/Engineering test results are reported under four MCAS reporting categories, which are identical to the four framework content strands listed above.

Test Sessions

The MCAS grade 8 Science and Technology/Engineering test included two separate test sessions. Each session included multiple-choice and open-response questions. Approximately half of the common test items are shown on the following pages as they appeared in test booklets.

Reference Materials and Tools

The use of bilingual word-to-word dictionaries was allowed for current and former limited English proficient students only, during both Science and Technology/Engineering test sessions. No other reference tools or materials were allowed.

Cross-Reference Information

The tables at the conclusion of this chapter indicate each released and unreleased common item's reporting category and the framework learning standard it assesses. The correct answers for released multiple-choice questions are also displayed in the released item table.

Science and Technology/Engineering

SESSION 1

DIRECTIONS

This session contains ten multiple-choice questions and one open-response question. Mark your answers to these questions in the spaces provided in your Student Answer Booklet.

1 Which of the following is the **main** reason water at the surface of the ocean is warmer than water at the bottom of the ocean?

- A. Water at the bottom of the ocean contains more dissolved solids.
- B. Water at the surface of the ocean absorbs more energy from the Sun.
- C. Friction is created by fast moving currents at the surface of the ocean.
- D. Wave action transfers heat from the bottom of the ocean to the surface.

2 Which body system typically recognizes, attacks, and destroys foreign cells or substances that may cause disease?

- A. digestive
- B. excretory
- C. immune
- D. respiratory

3 A student prepared the following list of characteristics about a cellular organelle.

- present in animal cells
- present in plant cells
- helps make energy available to the cell

Which of the following cellular structures is the student describing?

- A. cell wall
- B. chloroplast
- C. mitochondrion
- D. nucleus

- 4 The diagram below shows information about the motion of a toy car between two points on a track.

Motion of Toy Car



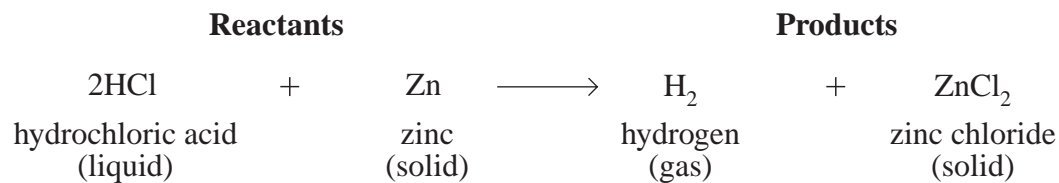
Which of the following can be determined using the information shown in the diagram?

- A. the car's position after the first two seconds
- B. the car's mass as it moves away from the start
- C. the car's average speed between the two points
- D. the car's total acceleration within the first meter

- 5 Human activity **most likely** contributes to which of the following changes on Earth?

- A. an increase in the length of a day
- B. a decrease in the number of volcanic eruptions
- C. a decrease in the magnitude of large earthquakes
- D. an increase in the amount of atmospheric carbon dioxide

- 6 In the chemical reaction shown below, all of the HCl and Zn will react to form H₂ and ZnCl₂.



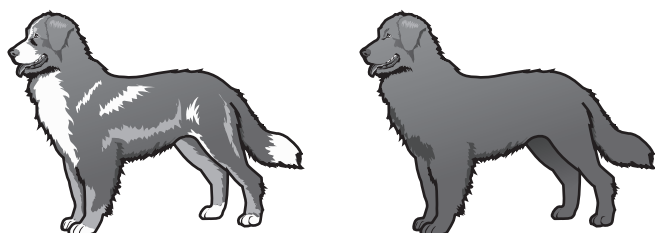
Which of the following statements describes the result of this reaction?

- A. The hydrogen gas will have a mass of zero.
- B. The zinc chloride will have less mass than the zinc.
- C. The mass of the products will equal the mass of the reactants.
- D. The mass of the hydrogen atoms will decrease in the products.

- 7 A movie studio will use two methods of communication, television and the Internet, to advertise a new movie. Which of the following **must** both methods of communication use in order to show the advertisements to viewers around the world?

A. systems to locate viewers
 B. networks to transmit signals
 C. printing to create the images
 D. software to search for images

- 8 The pictures below show two dogs of the same breed that have different coat colors.

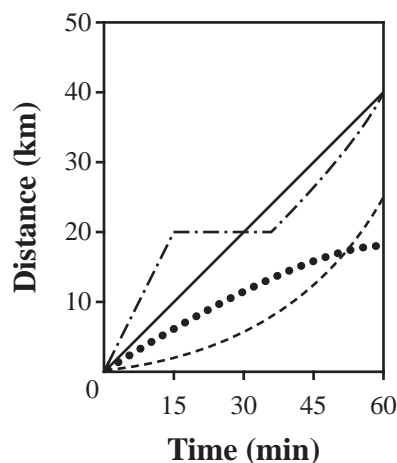


The instructions that determine coat color are stored in the

A. cytoplasm of skin cells.
 B. membrane of every cell.
 C. mitochondria of hair cells.
 D. chromosomes of every cell.

- 9 The graph below shows the motion of four different bicyclists during a one-hour bicycle ride.

Motion of Bicyclists

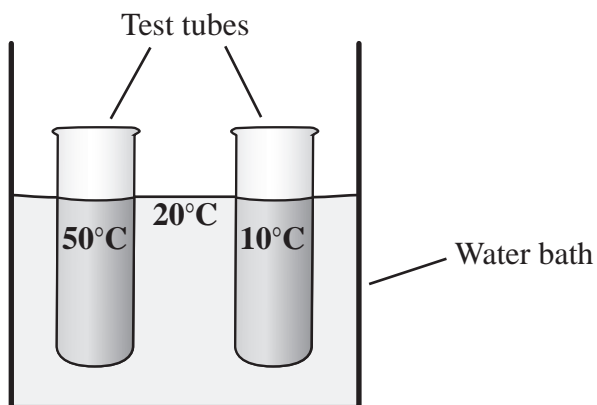


Key	
·····	Bicyclist R
----	Bicyclist S
.....	Bicyclist T
—	Bicyclist U

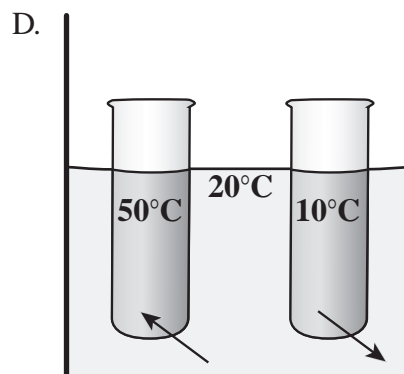
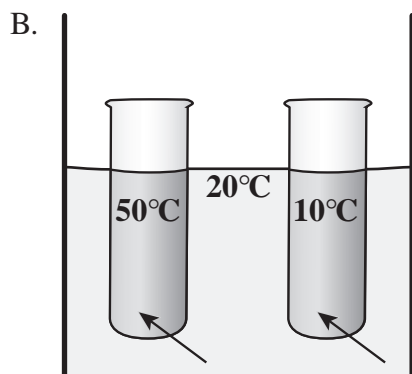
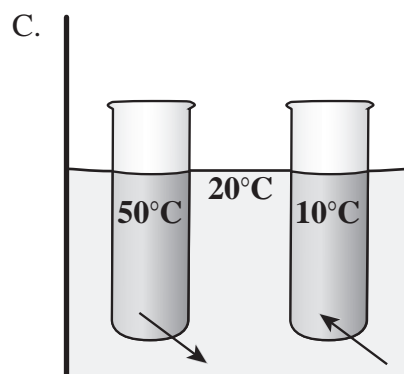
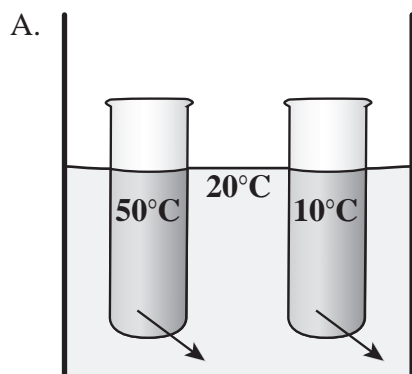
Based on the graph, which bicyclist traveled at a constant speed during the entire ride?

A. bicyclist R
 B. bicyclist S
 C. bicyclist T
 D. bicyclist U

- 10 A teacher put one test tube of 50°C liquid and one test tube of 10°C liquid into a 20°C water bath, as shown in the diagram below.



Which of the following diagrams **best** represents the directions that heat will move when the test tubes are placed into the water bath?

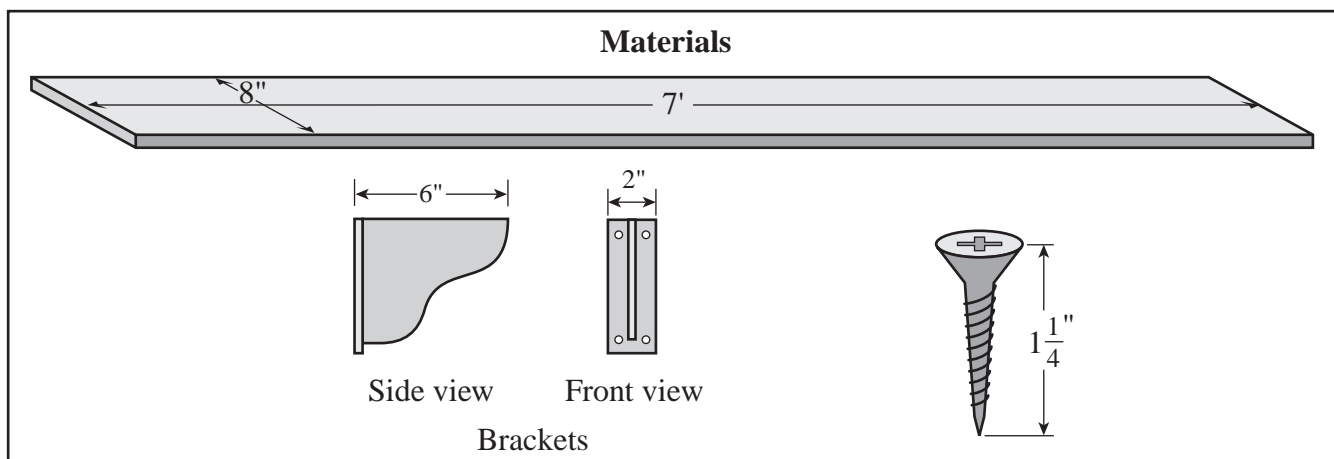
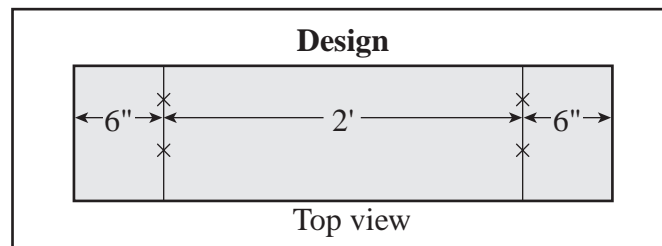
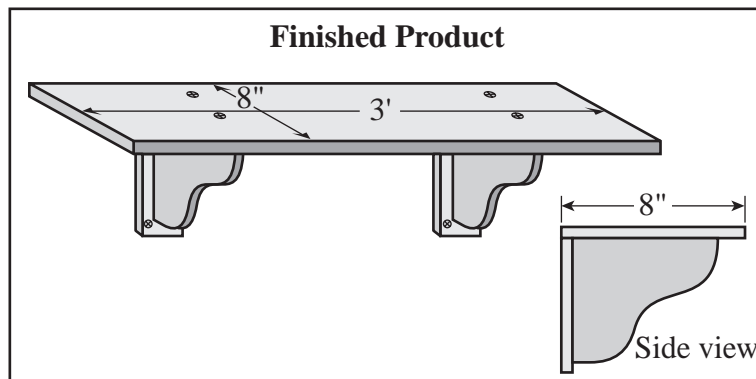


Question 11 is an open-response question.

- **BE SURE TO ANSWER AND LABEL ALL PARTS OF THE QUESTION.**
- **Show all your work (diagrams, tables, or computations) in your Student Answer Booklet.**
- **If you do the work in your head, explain in writing how you did the work.**

Write your answer to question 11 in the space provided in your Student Answer Booklet.

- 11** A design for a wooden shelf is shown below. The materials available for construction include one $1'' \times 8'' \times 7'$ board, four wooden shelf brackets with backer boards, and 24 $1\frac{1}{4}''$ wood screws. Examples of the materials are illustrated beneath the design of the shelf.



Sue wants to make two of these 3-foot-long shelves using these materials.

- Describe the steps Sue should take to complete this project. Include in your discussion the tools Sue needs to use in **each** step.
- Identify and describe **one** safety precaution Sue needs to follow in completing the project.

Science and Technology/Engineering

SESSION 2

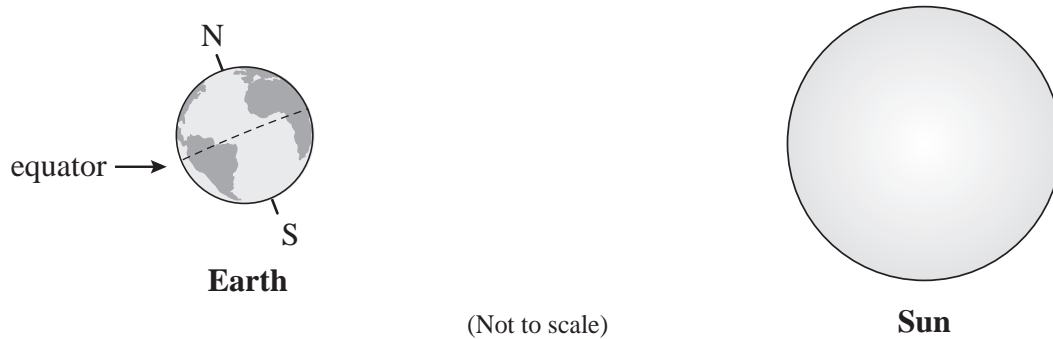
DIRECTIONS

This session contains nine multiple-choice questions and one open-response question. Mark your answers to these questions in the spaces provided in your Student Answer Booklet.

12 Which of the following is produced when two or more elements combine in a chemical reaction?

- A. atom
- B. compound
- C. mixture
- D. solution

- 13 The diagram below shows the relative positions of Earth and the Sun at a certain time of year.



Based on the diagram, which season is occurring in the Southern Hemisphere of Earth?

- A. winter
- B. spring
- C. summer
- D. fall

14 Which of the following **best** describes the function of an encoder in a telephone communication system?

- A. converting sound to electrical impulses
- B. receiving transmitted electrical signals
- C. changing electrical impulses into sound
- D. sending electrical signals through a circuit

15 Which of the following statements **best** describes photosynthesis?

- A. Carbon dioxide and water are turned into sugar and oxygen.
- B. Sugar and oxygen are turned into water and carbon dioxide.
- C. Oxygen and carbon dioxide are turned into water and sugar.
- D. Water and sugar are turned into oxygen and carbon dioxide.

16 Which of the following units **best** represents the density of an object?

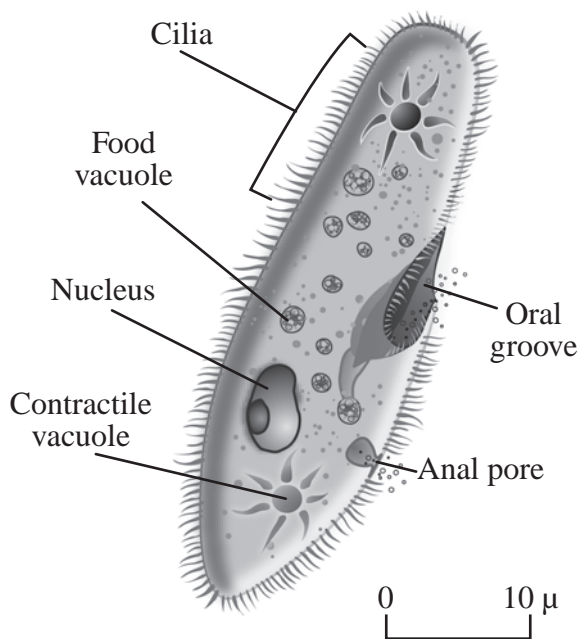
- A. kg
- B. hr
- C. m/s^2
- D. g/cm^3

17 During the construction of a new building, workers dug round holes in the ground and filled the holes with steel and concrete. Which of the following parts of the building was being built during this stage of construction?

- A. the floor
- B. the foundation
- C. the plumbing
- D. the walls

- 18 Which of the following provides the **best** evidence that Earth has evolved over geologic time?
- A. coral reefs that slowly changed size
 - B. desert sand dunes that were shaped by winds
 - C. deposits of sediment found at the mouth of a river
 - D. rock containing fossilized seashells found on a mountaintop

- 19 The picture below shows a paramecium.



In which kingdom is the paramecium classified?

- A. Animalia
- B. Fungi
- C. Plantae
- D. Protista

- 20 Jerome crossed two purple-flowered plants. The offspring produced from this cross had either white flowers or purple flowers, as shown in the table below.

Number of Offspring	Flower Color
10	Purple
3	White

Which of the following statements **best** explains why some of the offspring have white flowers?

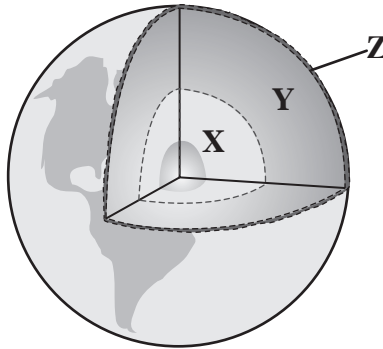
- A. These offspring were created by asexual reproduction.
- B. These offspring were produced in a dark environment.
- C. These offspring inherited a DNA sequence coding for white flowers from each parent plant.
- D. These offspring inherited a DNA sequence coding for white flowers from only one parent plant.

Question 21 is an open-response question.

- **BE SURE TO ANSWER AND LABEL ALL PARTS OF THE QUESTION.**
- **Show all your work (diagrams, tables, or computations) in your Student Answer Booklet.**
- **If you do the work in your head, explain in writing how you did the work.**

Write your answer to question 21 in the space provided in your Student Answer Booklet.

- 21** The diagram below shows three main layers that compose Earth. The layers are labeled X, Y, and Z.



- Identify **each** of the three layers of Earth (X, Y, and Z) labeled in the diagram.
- Describe **one** characteristic of the layer labeled X.
- Describe **one** characteristic of the layer labeled Y.
- Describe **one** way that the layer labeled Y interacts with the layer labeled Z.

Grade 8 Science and Technology/Engineering
Spring 2011 Released Items:
Reporting Categories, Standards, and Correct Answers*

Item No.	Page No.	Reporting Category	Standard	Correct Answer (MC)*
1	286	Earth and Space Science	4	B
2	286	Life Science	6	C
3	286	Life Science	3	C
4	287	Physical Sciences	11	C
5	287	Life Science	17	D
6	288	Physical Sciences	4	C
7	289	Technology/Engineering	3.3	B
8	289	Life Science	7	D
9	289	Physical Sciences	12	D
10	290	Physical Sciences	16	C
11	291	Technology/Engineering	1.3	
12	292	Physical Sciences	7	B
13	293	Earth and Space Science	11	C
14	294	Technology/Engineering	3.1	A
15	294	Life Science	16	A
16	294	Physical Sciences	2	D
17	294	Technology/Engineering	5.1	B
18	295	Earth and Space Science	7	D
19	295	Life Science	1	D
20	295	Life Science	9	C
21	296	Earth and Space Science	2	

* Answers are provided here for multiple-choice items only. Sample responses and scoring guidelines for open-response items, which are indicated by shaded cells, will be posted to the Department's website later this year.

**Grade 8 Science and Technology/Engineering
Spring 2011 Unreleased Common Items:
Reporting Categories and Standards**

Item No.	Reporting Category	Standard
22	<i>Technology/Engineering</i>	6.4
23	<i>Physical Sciences</i>	5
24	<i>Technology/Engineering</i>	2.1
25	<i>Earth and Space Science</i>	12
26	<i>Technology/Engineering</i>	1.1
27	<i>Earth and Space Science</i>	9
28	<i>Earth and Space Science</i>	10
29	<i>Life Science</i>	15
30	<i>Technology/Engineering</i>	1.2
31	<i>Life Science</i>	4
32	<i>Earth and Space Science</i>	6
33	<i>Earth and Space Science</i>	5
34	<i>Life Science</i>	14
35	<i>Technology/Engineering</i>	6.1
36	<i>Physical Sciences</i>	3
37	<i>Life Science</i>	10
38	<i>Earth and Space Science</i>	8
39	<i>Earth and Space Science</i>	1
40	<i>Physical Sciences</i>	1
41	<i>Technology/Engineering</i>	2.2
42	<i>Physical Sciences</i>	10